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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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ENIN-OKUT, EDUE				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary****Application No.**

10/559,152

**Applicant(s)**

DZIALLAS ET AL.

**Examiner**

Edu E. Enin-Okut

**Art Unit**

1727

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 July 2011.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 5) ☒ Claim(s) 26-38 is/are pending in the application.
- 5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 26-38 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 7/29/11
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_

**MEMBRANE-ELECTRODE UNIT FOR DIRECT METHANOL FUEL CELLS  
AND METHOD FOR THE PRODUCTION THEREOF**

***Detailed Action***

1. The amendments filed on July 229, 2011 were received. Applicant has cancelled 14-20, 22 and 24; and, added claims 26-38. Claims 26-387 are pending.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

***Priority***

3. As discussed on p. 5 of applicant's remarks, the Petition Decision filed on July 25, 2011 grants applicant's petition to claim benefit of priority to non-provisional Application No. 10/308,491 under 35 U.S.C. 120, 121, or 365(c) in an amendment to its specification filed on July 12, 2011. Thus, applicant's claim for the benefit of a prior-filed application under 35 U.S.C. 119(e) or under 35 U.S.C. 120, 121, or 365(c) is acknowledged. However, applicant has not complied with one or more conditions for receiving the benefit of an earlier filing date under 35 U.S.C. 120 as follows:

The later-filed application must be an application for a patent for an invention which is also disclosed in the prior application (the parent or original nonprovisional application or provisional application). The disclosure of the invention in the parent application and in the later-filed application must be sufficient to comply with the requirements of the first paragraph of 35 U.S.C. 112. See *Transco Products, Inc. v. Performance Contracting, Inc.*, 38 F.3d 551, 32 USPQ2d 1077 (Fed. Cir. 1994).

The disclosure of the prior-filed application, Application No. 10/308,491, fails to provide adequate support or enablement in the manner provided by the first paragraph of 35 U.S.C. 112 for one or more claims of this application. The application described above does not provide support or enablement for the following:

- "... said steps (a) to (g) resulting in a membrane electrode unit with a double-layer anode, having a larger catalyst layer thickness than the resulting cathode catalyst layer." as recited in claim 26. (Claims 27-38 depend upon claim 26.)
- "... the anode catalyst layer has a thickness of between 20 and 200 micron." as recited in claim 27.
- "... the cathode catalyst layer has a thickness between 5 to 50 micron." as recited in claims 28 and 29.
- "... the anode catalyst layer has a thickness that is larger than a thickness of the catalyst layer by a factor 3 to 4." as recited in claim 37.
- "... the anode catalyst layer has a catalyst loading that is greater than the cathode catalyst loading by a factor of 2.5." as recited in claim 38.

#### ***Information Disclosure Statement***

4. The information disclosure statement (IDS) filed July 29, 2011 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. (Examiner's Note: Applicant has failed to provide a copy of EP 1 258 936 listed on the IDS.)

***Claim Objections***

5. The objection to claim 25 is withdrawn because claim 25 was cancelled.

***Claim Rejections - 35 USC § 102***

6. The rejection of claims 14, 18-20, 22 and 23 under 35 U.S.C. 102(e) as being anticipated by Wittpahl et al. (US 7,141,270 B2) is withdrawn because claims 14, 18-20, 22, and 23 were cancelled.

***Claim Rejections - 35 USC § 103***

7. The rejection of claim 25 under 35 U.S.C. 103(a) as being unpatentable over Wittpahl et al. (US 7,141,270 B2) is withdrawn because claim 25 was cancelled.
8. The rejections of claims 14-20, 22, 23, and 25 under 35 U.S.C. 103(a) as being unpatentable over Tabata et al. (US 2002/0071980 A1), in view of Yamashita et al. (US 5,441,822), Kindler (US 5,992,008), and Wittpahl et al. (US 7,141,270), are withdrawn because claims 14-20, 22, 23, and 25 were cancelled.
9. Claims 26-35, 37, and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamo et al. (US 2002/0172853) in view of Tabata et al. (US 2002/0071980 A1).

*Regarding claims 26 and 35*, Kamo teaches fuel cells, including direct methanol fuel cells, that employ a unit cell composed of laminated structure that includes a porous anode current collector, an anode, an electrolyte membrane, a cathode, and a porous cathode current collector (Abstract; para. 18,66,76). Formation of the unit cell can include forming the anode by coating the porous anode current collector ("anode gas diffusion substrate") with a paste and

drying the paste to a finished thickness of 10-50  $\mu\text{m}$  (para. 68,90,91). Alternatively, unit cell formation can include forming anode (50  $\mu\text{m}$  thick) by coating (e.g., by screen printing process) one side of an electrolyte membrane ("ionomer membrane") with a paste and drying the paste (para. 101); coating the other side of the membrane with a paste to form a cathode (15  $\mu\text{m}$  thick) and drying that paste (para. 102); and, disposing a diffusion layer (part of the "cathode gas diffusion substrate") and a porous cathode current collector (part of "cathode gas diffusion substrate") on the cathode (para.103,105,96).

Kamo does not expressly teach use of a catalyst ink; or, combining the methods to form the unit cell with a double layer anode.

However, Tabata teaches a method of forming a membrane electrode assembly ("membrane electrode unit"), useful in a fuel cell, where the both sides of an electrolyte membrane are coated by catalyst (Abstract; para. 59; Claims 1,6,7). The catalyst layers can be formed directly on the surface of an electrolyte membrane by spraying or screen printing (para. 9,24,43). (For example, a catalyst ink may be coated on one side of the membrane with the subsequent removal of the ink's solvent or dispersant (para. 45-49).) The catalyst is also coated on a gas diffusion layer and subsequently air dried (para. 60). The membrane electrode assembly is effective when the structure obtained by laminating a membrane/catalyst layer conjugate and a gas diffusion layer/catalyst layer conjugate is provided on at least one side of the assembly (either its anode side or the cathode side) (para. 23-26,31; Claims 1,6).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the methods to form the unit cell employed in the fuel cell taught by Kamo, and use anode and cathode catalyst inks in its formation, thus forming a double-layer anode in that cell because combining the methods of forming anode layers described by Kamo is well within the skill of one of ordinary skill in the art; and, Tabata teaches that the electrodes of a fuel cell

membrane electrode assembly (MEA) can be formed using catalyst inks, bi-layer electrodes formed in this manner can minimize damage to the membrane during cell assembly (see Tabata, para. 35,36), and, employing MEAs with bi-layer electrodes can demonstrate higher initial performance (see Tabata, para. 16).

*Regarding claim 27, 28, 29, and 37*, modified Kamo teaches that the anode can have a thickness from 60-100  $\mu\text{m}$ , from the thickness of the anode layers formed on the porous current collector and electrolyte membrane as described above. Kamo teaches that the cathode has a thickness of 15  $\mu\text{m}$ , also discussed above. Thus, the thickness of the anode layer from 4 to 6.7 times greater than that of the cathode.

*Regarding claims 30, 31, 32, 33, and 38*, Kamo teaches that the anode includes platinum and ruthenium catalyst with a total catalyst content of about 1.95 - 3  $\text{mg}/\text{cm}^2$  (para. 91,101). The cathode includes a platinum-carrying carbon powder catalyst where the quantity of platinum is about 0.8  $\text{mg}/\text{cm}^2$  (para. 102,103). Thus, the catalyst loading of the anode is from 2.4 to 3.75 is greater than that of the cathode.

10. Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kamo et al. (US 2002/0172853) and Tabata et al. (US 2002/0071980 A1) as applied to claims 26-35, 37 and 38 above, and further in view of YourDictionary.com.

Kamo and Tabata are applied and incorporated herein for the reasons above.

*Regarding claim 36*, Kamo teaches the cathode can employ a diffusion layer composed of a carbon fiber nonwoven fabric coated a water repellent dispersion with fine particles of polytetrafluoroethylene (PTFE) (para. 95,103).

Although Kamo does not expressly teach a carbon fiber *paper* [emphasis added], paper is defined as being used as a fabric substitute (see "paper" on YourDictionary.com). Thus, it

would have been obvious to one of ordinary skill in the art at the time of the invention to use a carbon fiber paper when forming the cathode diffusion layer employed in the fuel cell of Kamo because paper can serve as a fabric substitute, as taught above; and, substitution of one known element for another yields predictable results to one of ordinary skill in the art. *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1395-97 (2007). See MPEP 2143.

### ***Response to Arguments***

11. Applicant's arguments with filed on July 29, 2011 have been considered but applicant has amended the claims such that new grounds of rejection were necessitated.

### ***Conclusion***

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.



***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Edu E. Enin-Okut** whose telephone number is **571-270-3075**. The examiner can normally be reached on Monday through Thursday, 7 am to 3 pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Barbara L. Gilliam can be reached on 571-272-1330. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Edu E. Enin-Okut/  
Examiner, Art Unit 1727

/Barbara L. Gilliam/  
Supervisory Patent Examiner, Art Unit 1727